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(54) An acid-resistant flooring composition

(57) The Specification describes an acid-resistant flooring composition intended principally for industrial use particularly in environments where spillage of acidic substances is a common hazard. The composition comprises an epoxy resin and a filler wherein the filler comprises chippings of an acid-resistant rock or mineral. The filler may also contain sand or silica flour and the chippings may be granite or quartz. The average particle diameter of the chippings is preferably in the 3 mm to 20 mm.

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SPECIFICATION

An acid-resistant flooring composition

This invention relates to an acid-resistant flooring composition. The composition is intended principally for industrial use, particularly in environments where spillage of acidic substances is a common hazard.

Acid-resistant flooring compositions based on epoxy resins are well known. They usually contain a filler or extender, which may be silica sand or silica flour or a mixture of the two. One reason for incorporating a filler is to reduce the cost of the composition per unit floor area covered, which cost would be prohibitive in the case of a flooring composition based on epoxy resins without a filler. Another reason is that the silica filler imparts desirable properties to a floor made from a composition containing it, such as hardness and durability.

Nevertheless known acid-resistant epoxy resin flooring compositions have certain disadvantages in use, which include their high cost, and a tendency to craze, split and fragment as a result of temperature variation. Such compositions are normally laid on concrete bases, and have a coefficient of thermal expansion markedly different from that of concrete, which accounts for the above recited behaviour. The compositions are also somewhat deficient in toughness and resistance to wear.

Among the objects of the present invention is the elimination or alleviation of some or all of the above recited disadvantages.

In known compositions the sand filler, as stated, acts as an extender of the expensive epoxy resin. It is desirable to reduce the cost of epoxy resin flooring compositions as much as possible, by incorporating the maximum proportion of inexpensive filler consistent with adequate properties and performance of the resulting floor. It does not appear to have been realised in the past, just how far one can go in realising this ideal. We have now found, surprisingly, that a ratio as great as 7:1 (filler to unset epoxy resin) can be used with satisfactory results. but only when the additional filler consists largely of sizeable chippings instead of sand.

The present invention accordingly provides an acid-resistant flooring composition of the type comprising an epoxy resin and a filler, characterised in that the filler comprises chippings of an acid-resistant rock or mineral.

Preferably the filler comprises sand and/or silica flour in addition to the chippings. Preferably the chippings are of quartz or granite. It will be clear that minerals such as limestone, marble and chalk are unsuitable for lack of acid-resistance. Preferably the average particle diameter of the chippings is in the range 3 mm to 20 mm.

The proportion of filler in the composition can be expressed in terms of the ratio of the bulk volume of the filler to that of the epoxy resin mixture before it sets. Preferably this ratio is from 5:1 to 7:1, more preferably about 5.5:1.0.

In an embodiment wherein the filler comprises sand as well as chippings the ratio of the bulk volume of the sand to that of the chippings is desirably from 1.2:1.0 to 2.7:1.0, more preferably about 1.75:1.0.

Known compositions containing sand are conventionally laid to a thickness of about 10 mm or 3/8". Compositions of the invention, however, are conveniently laid to a somewhat greater depth such as 20 to 30 mm. The precise depth required or desirable depends mainly on the mean particle size of the chippings used. The greater depths recommended in the performance of the invention result in floors which are no more expensive than those of the prior art having much smaller depths, and are often less expensive.

It will be seen that the invention exploits the unsuspectedly great covering power of the commercial grades of epoxy resins heretofore used for making flooring compositions, a covering power which had been by no means exhausted by the incorporation of the low proportions of sand or silica flour heretofore customary. Such grades include for example those marketed for the purpose by Ciba-Geigy of Switzerland under the Trade Mark ARALDITE and its variations.

The invention will be appreciated in greater detail from the following example of a particular and preferred embodiment thereof. Measurements are in parts by volume: in the case of sand and chippings bulk volume is intended, i.e. including the space between the particles.

EXAMPLE

An epoxy resin composition was prepared by intimately mixing 5 parts Araldite base with 3 parts Araldite hardener. This mixture remains workable for several hours.

To 0.05 m^3 of the above mixture was added 0.175 m^3 of sharp washed silica sand and 0.1 m^3 of sharp quartz chippings of mean particle diameter 12 mm, and the whole thoroughly mixed in a powered blender supplied by the suppliers of the resin.

A pre-existing concrete floor was cleaned of oil and grease, washed with water and allowed to dry, prior to the making up of the above composition.

The composition was deposited on the concrete from the blender, roughly distributed and then trowelled and floated to a mean thickness of 25 mm. Nine further similar batches were made and laid.

The composition was practically self-levelling, and covered in all an area of 128 square meters, where it was allowed to harden.

In 36 hours the hardened composition provided a smooth, even, tough, acid-proof, strongly adhering floor, capable of withstanding a continuous traffic of heavy vehicles with narrow-rimmed steel wheels. Samples of the floor, when tested, proved to have a co-efficient of thermal expansion very near to that of the underlying concrete. Thus a major cause of cracking and crazing had been eliminated: conventional flooring compositions, when set, mostly have a coefficient of thermal expansion greater than that of concrete. A cost comparison showed that the material, with a thickness of 25 mm, was cheaper per unit area than a conventional composition laid to a conventional thickness of 10 mm.

Cupons of the laid composition were cut out for testing. Similarly sized cupons were removed from a typical composition floor of the prior art and used as controls.

Test and control cupons were immersed in various acidic liquors and examined periodically. The results are set out in the following Tables 1 and 2.

TABLE 1

TESTING FLOORING COMPOUNDS

TEST: Cupons immersed in various liquors for 16 days at 70°C.

Test liquor	% WEIGHT CHANGE		APPEARANCE		MECHANICAL PROPERTIES	
	Control Cupons	Test Cupons	Control Cupons	Test Cupons	Control Cupons	Test Cupons
Sodium citrate 30% W/W	+0.7	+0.2	As original	Slightly discoloured	No visible attack	N.V.A.
Sodium citrate 60% W/W	+1.2	+0.3	As original	Slightly discoloured	N.V.A.	N.V.A.
Gluconic acid 30% W/W	+3.1	+0.2	Slightly discoloured	Discoloured	N.V.A.	N.V.A.
Gluconic acid 100% W/W	+2.3	+0.2	Discoloured	Discoloured	N.V.A.	N.V.A.
Sulphuric acid 2% W/W	+9.0	+0.2	Badly discoloured	Badly discoloured	Softened easily broken	N.V.A.
Sulphuric acid 10% W/W	+13.1	0	Badly discoloured	Badly discoloured	Softened, surface cracked, easily broken	N.V.A.
Citric old liquor	+3.4	+0.3	Badly discoloured	Badly discoloured	Sl. softening	N.V.A.
Citric whole broth	+2.4	+0.3	Discoloured	Slightly discoloured	N.V.A.	N.V.A.
Sodium hydroxide 46% W/W	+0.9	0	Slightly discoloured	Slightly discoloured	N.V.A.	N.V.A.

TABLE 2

TEST: Cupons immersed in citric oi liquor 10 days at 90°C.

	Test Cupons	Control Cupons
% weight change	+ 0.5	+ 14.6
Appearance	Badly discoloured	Badly discoloured
Mechanical Properties	Soft on removing from liquor. When cooled as original.	V. soft and surface cracked on removing, when cooled brittle, easily broken.

CLAIMS

1. An acid-resistant flooring composition of the type comprising an epoxy resin and a filler characterised in that the filler comprises chippings of an acid-resistant rock or mineral.

2. A composition as claimed in claim 1 wherein the filler additionally comprises sand.

3. A composition as claimed in claim 1 or claim 2 wherein the filler additionally comprises silica flour.

4. A composition as claimed in any of claims 1—3 wherein the chippings are of quartz or granite.

5. A composition as claimed in any of claims 1—4 wherein the average particle diameter of the chippings is in the range 3 mm to 20 mm.

6. A composition as claimed in any of claims 1—5 wherein the ratio of the bulk volume of the filler to that of the epoxy resin mixture before setting is from 5:1 to 7:1.

7. A composition as claimed in claim 6 wherein the ratio of 5.5:1.0.

8. A composition as claimed in claim 2 or claims 3—7 when dependent on claim 2 wherein the ratio of the bulk volume of the sand to that of the chippings is from 1.2:1.0 to 2.7:1.0.

9. A composition as claimed in claim 8 wherein the ratio is 5.5:1.0.

10. A composition as claimed in any of claims 1—9 substantially as hereinbefore described and with reference to the Example.

11. A method of laying a composition as claimed in any of claims 1—10 substantially as hereinbefore described and with reference to the Example.

12. An acid-resistant floor which comprises a composition as claimed in any of claims 1—10 substantially as hereinbefore described and with reference to the Example.

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